# US Patent 5,611,049, Claim 16:

16. A network of digital computers that includes a first plurality of client sites which request access to a stored dataset that is stored at a location that can be accessed through the network, the network comprising:

a second plurality of NDC sites, the stored dataset whose access is requested by the client sites being stored at an NDC server terminator site, a request from the client sites for access to the stored dataset being received by a third plurality of NDC client terminator sites, each NDC site including:

(a) an NDC that has an NDC buffer;

(b) means for the NDC to receive the request to access the stored dataset;

(c) means for the NDC to check the NDC buffer at this NDC site to determine if a projected image of data requested from the stored dataset is already present there, wherein:

i. if the NDC buffer of this NDC site does not contain a projected image of all data requested from the stored dataset, and if this NDC site is not the NDC server terminator site for the stored dataset, the NDC includes means for transmitting a request for data from this NDC site downstream to another NDC site closer to the NDC server terminator site for the stored dataset than the present NDC site;

ii. if the NDC buffer of this NDC site does not contain a projected image of all data requested from the stored dataset, and if this NDC site is the NDC server terminator site for the stored dataset, the NDC including means for accessing the stored dataset to project an image of the requested data into the buffer of this NDC; and

iii. if the NDC buffer of an NDC site contains a projected image of all requested data, the NDC including means for returning the data requested from this NDC site upstream to the NDC site from which this NDC site received the request, whereby through a succession of such returns of data from one NDC site to the next upstream NDC site the requested data ultimately arrives at the NDC client terminator site, each NDC site that returns data upstream to the requesting NDC site retaining a copy of the returned data that the returning NDC site may subsequently transmit to an NDC site other than the NDC site to which the returning NDC site first returned the data, whereby images of the stored dataset may be projected concurrently from a single NDC site into the third plurality of NDC client terminator sites; and

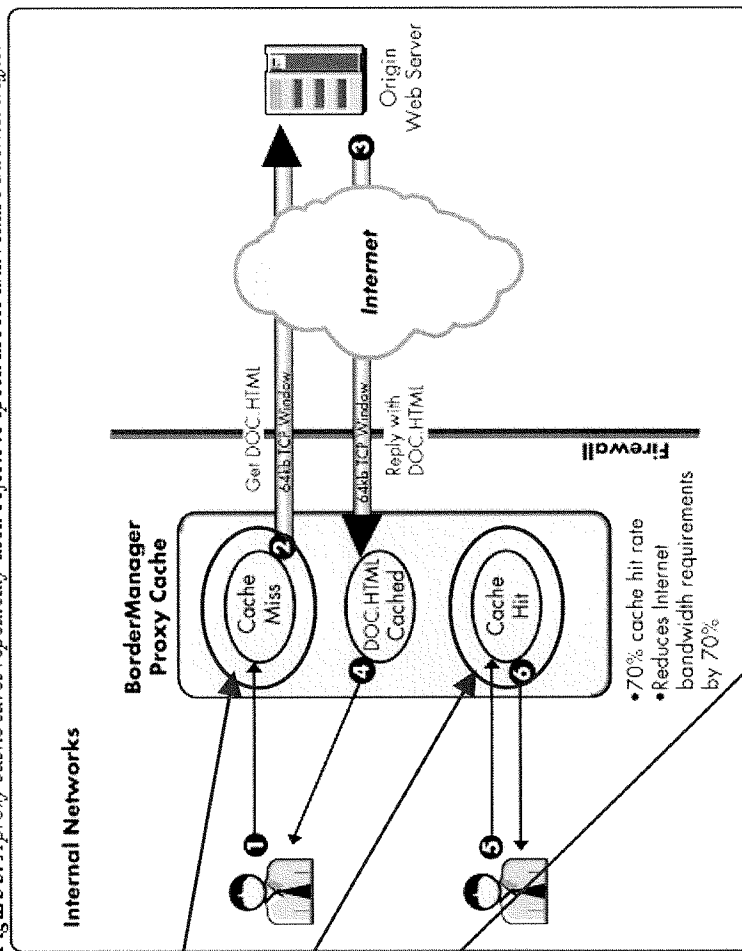(d) means for the NDC client terminator site to return the requested data to the client site that requested access to the stored dataset.

049.16
2

---

NCT010702

## How Proxy Cache Works

Figure 5 illustrates how BorderManager caches HTML documents and other cacheable content.

*Figure 5: A proxy cache saves repeatedly-used objects to speed access and reduce Internet traffic.*



Internal Networks

BorderManager
Proxy Cache

Cache Miss

DOC.HTML Cached

Cache Hit

Get DOC.HTML
64kb TCP Window

Reply with DOC.HTML
64kb TCP Window

Firewall

Internet

Origin Web Server

•70% cache hit rate
•Reduces Internet bandwidth requirements by 70%

1. A browser issues a request for a file named DOC.HTML. This request is sent to the proxy cache over a 10 Mbps Ethernet LAN segment. In this case, the request results in a "cache miss" because the proxy cache has never serviced a request for that document before.

2. The proxy cache initiates a request for DOC.HTML from the origin web server on behalf of the browser. This request is sent over a T1 line to an ISP, then traverses the Internet until it arrives at the origin server.

3. The origin web server responds to the proxy's request by sending DOC.HTML. This transmission is much faster than a response to a browser due to the proxy's optimized receive window that can receive up to 64KB at one time and stays open to receive multiple responses. The proxy then places DOC.HTML in its cache.

4. The proxy cache responds to the original browser request with DOC.HTML.

5. Now when the same browser (or any other browser) issues a request for DOC.HTML, the request results in a "cache hit" because the proxy has kept a copy of the document in its cache.

6. In this case, the proxy replies immediately to the browser request because it has DOC.HTML in cache. The proxy's response is transmitted at 10 Mbps to the browser, eliminating the need to fetch the document again from the origin server on the Internet.

(a)  **an NDC that has an NDC buffer;**

(b)  **means for the NDC to receive the request** to access the stored data;

(c)  means for the NDC to check the NDC buffer at this NDC site to determine if a projected image of data requested from the stored dataset is already present there, wherein:

049.16
16

**How Proxy Cache Works**

Figure 5 illustrates how BorderManager caches HTML documents and other cacheable content.

*Figure 5: A proxy cache saves repeatedly-used objects to speed access and reduce Internet traffic.*



1. A browser issues a request for a file named DOC.HTML. This request is sent to the proxy cache over a 10 Mbps Ethernet LAN segment. In this case, the request results in a "cache miss" because the proxy cache has never serviced a request for that document before.

2. The proxy cache initiates a request for DOC.HTML from the origin web server on behalf of the browser. This request is sent over a T1 line to an ISP, then traverses the Internet until it arrives at the origin server.

3. The origin web server responds to the proxy's request by sending DOC.HTML. This transmission is much faster than a response to a browser due to the proxy's optimized receive window that can receive up to 64KB at one time and stays open to receive multiple responses. The proxy then places DOC.HTML in its cache.

4. The proxy cache responds to the original browser request with DOC.HTML.

5. Now when the same browser (or any other browser) issues a request for DOC.HTML, the request results in a "cache hit" because the proxy has kept a copy of the document in its cache.

6. In this case, the proxy replies immediately to the browser request because it has DOC.HTML in cache. The proxy's response is transmitted at 10 Mbps to the browser, eliminating the need to fetch the document again from the origin server on the Internet.
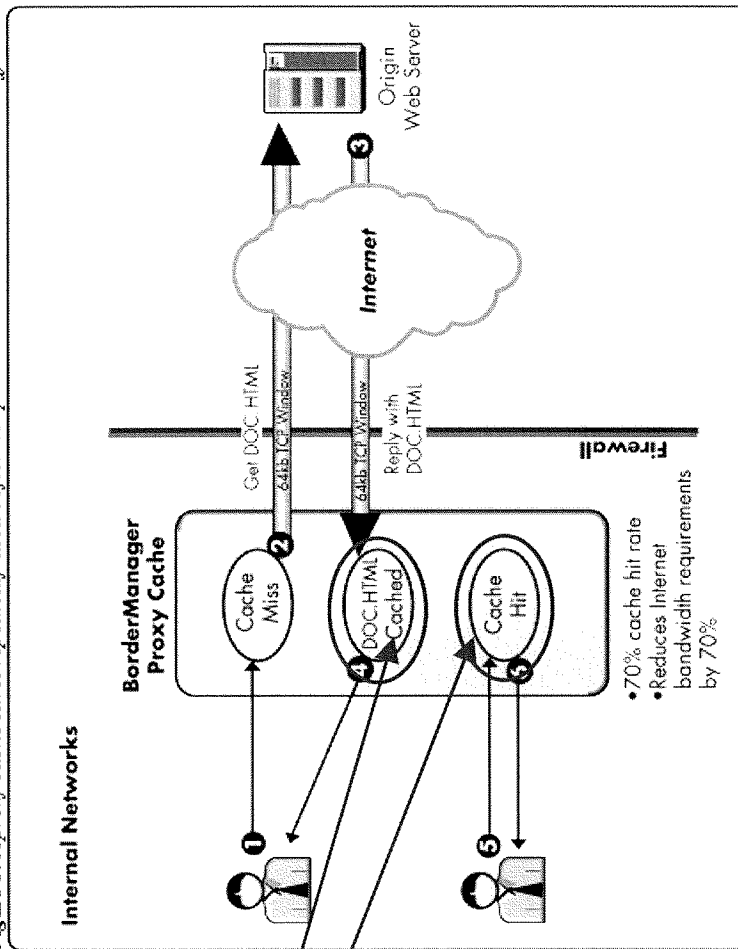
(a) an NDC that has an NDC buffer;

(b) means for the NDC to receive the request to access the stored data;

(c) means for the NDC to check the NDC buffer at this NDC site to determine if a projected image of data requested from the stored dataset is already present there, wherein:

NCT010717

049 16
17